



Changes in physical activity, sleep, mental health and social media use during COVID-19 lockdown among adolescent girls: a mixed methods study.

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Abstract

Background: To suppress the transmission of coronavirus, many governments, including that of the island of Ireland, implemented a societal lockdown which included school closures, limits on social gatherings and time outdoors. This study aimed to evaluate changes in physical activity (PA), mental health, sleep and social media use among adolescent girls during lockdown.

Methods: 281 female pupils (12-14 years) taking part in the ongoing Walking In Schools (WISH) Study on the island of Ireland self-reported PA, mental health, sleep and social media use before (Sept-Oct 2019), and during lockdown (May-June 2020), via questionnaires. These were supplemented with open-ended structured interviews conducted with 16 girls during lockdown.

Results: During the period of lockdown and school closures, pupils tried new forms of PA and undertook PA with family but there was no significant change in self-reported PA. There was a decline in health-related quality of life and motivation for exercise; however, self-efficacy for walking and happiness with appearance increased. There was no change in sleep quality or social media usage.

Conclusions: Despite the many challenges that schools face as they reopen, there is a need to continue to prioritise PA and motivation for exercise to support health and wellbeing in adolescent girls.

Background

On the 11th of March 2020, the World Health Organisation (WHO) announced a global pandemic caused by the coronavirus (COVID-19).¹ COVID-19 is an infectious disease caused by a newly discovered coronavirus which is transmitted primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes.² Recent figures indicate that worldwide by mid-September 2020, approximately 31 million people have contracted the virus and 950,000 people have died.³ Globally, many countries have imposed a period of 'lockdown' through public health legislation, which included the closure of non-essential businesses, social distancing, travel restrictions and limits on social gatherings. Based on data from previous influenza outbreaks that showed school closures reduce social contacts and therefore virus transmission^{4,5}, schools in both the Republic of Ireland (RoI) and Northern Ireland (NI) closed during the period of March to August 2020.

Extended school closures may not only adversely affect educational attainment but also the physical and mental health of children and adolescents.⁶ Although the decline in PA during school holidays is well established^{7,8}, it is not yet known how lockdown will have affected the PA levels of adolescents and in particular adolescent girls. It is recognised that adolescent females typically have lower levels of PA than their male counterparts⁹⁻¹¹ and prior to the pandemic, only 7.2% of adolescent girls in NI were meeting PA guidelines¹².

Previous research has shown that school closures and separation from friends can cause stress and anxiety in children and adolescents¹³. Social media and technology can help maintain social contact and during the pandemic increases in recreational screen-based activities, and time spent on social media have been reported¹⁴.

However, there is evidence of an association between mobile screen use and adverse mental health and wellbeing outcomes in young people^{15,16}. Frequent mobile phone use has also been associated with sleep problems¹⁶ and in particular, the use of digital media near bedtime could negatively affect sleep¹⁷. In addition, sleep quality is lower during school holiday closures¹⁸, which may exacerbate feelings of low mood, stress and anxiety¹⁹ during periods of lockdown.

The future of COVID-19 is unknown, further outbreaks and new lockdowns are possible, and measures such as social distancing may be in place for some time²⁰. Prior to the pandemic, the mental health of adolescent girls on the island of Ireland was of concern^{21,22} and it is important that we understand how the restrictions implemented to control the transmission of COVID-19 affected their health and wellbeing. The findings of this study may inform future public health strategies and indicate the support measures required for adolescent girls impacted by societal lockdowns and school closures.

This paper draws on data collected from a mixed-method study to: a) understand how the PA levels of adolescent girls were affected by lockdown, social distancing and school closures which were enforced as part of the governments' (Northern Ireland Executive and the Government of Ireland) response to COVID-19; and b) evaluate changes in mental health, sleep and social media usage among adolescent girls before and during lockdown.

Methods

Sample and recruitment

Participants were those who took part in Phase 1 (September 2019) of the Walking In SchHools (WISH) Study. The recruitment methods used within the WISH Study have been outlined previously.²³ In brief, all post-primary schools in Co Donegal (RoI) with an enrolment of >240 girls and all post-primary schools Co Derry/Londonderry (NI) with ≥80 girls across years 9-10 were invited to participate in the study. Female pupils aged 12-14 years were invited to take part in the study and all potential pupils (and parents/guardians) were provided with a copy of the participant information sheet. Parents/guardians were asked to provide written consent. Written assent was obtained from pupils. The present study was conducted according to the guidelines laid down in the Declaration of Helsinki, and all procedures were approved by Ulster University Research Ethics Committee (Ref: REC/19/0020).

Quantitative Data Collection

At baseline (September – October 2019; before lockdown), pupils (12-14 years) were asked to complete a series of questionnaires within the school premises on electronic devices (Apple iPad®) using Qualtrics (Provo, Utah, USA). At follow-up (May to June 2020; during lockdown), the key contact in each school was asked to circulate the Qualtrics link to pupils via email or online learning platforms. The questionnaires were piloted and modified to ensure there was no ambiguity in the questions and to identify any potential problems the participant might experience. Questionnaires were estimated to take no longer than 30 minutes to complete.

PA: The PACE+ questionnaire^{24,25} was adapted to capture levels of PA before school closures and the implementation of government restrictions. At the beginning of the questionnaire, pupils were asked to self-report their PA levels before school closures and lockdown, 1) “Thinking back to your last week at school, before coronavirus and

lockdown, on how many days were you physically active for a total of at least 60 minutes per day?” and 2) “When you were at school, over a typical or usual week, on how many days were you physically active for a total of at least 60 minutes per day?”. From these two questions, the average number of days per week that pupils accumulated 60 minutes of moderate-to-vigorous PA (MVPA) was calculated. Compliance with PA recommendations was assessed by creating a binary variable for those achieving/not achieving ≥ 5 days with at least 60 mins of MVPA.²⁴ At the end of the questionnaire, pupils were then asked to self-report their current levels of PA (during lockdown) and the average number of days that pupils accumulated 60 mins of MVPA per week and compliance with PA recommendations was assessed.^{24,25}

Health Related Quality of Life: Self-reported wellbeing was assessed using the KIDSCREEN-10 instrument.²⁶ Total scores were calculated, and a higher score indicated a better health-related quality of life.²⁶

Emotion regulation: The Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA) was used to assess cognitive reappraisal (changing the way one thinks about potentially emotion-eliciting events) and expressive suppression (changing the way one behaviourally responds to emotion-eliciting events).^{27,28} Scores were calculated for cognitive reappraisal and expression suppression, where higher scores on each subscale represented a greater use of that emotion regulation strategy.

Body weight and appearance satisfaction: Using the questions adopted for the UK Millennium Cohort Study,²⁹ body weight satisfaction was assessed using three questions. Responses were combined to generate a body satisfaction variable;

satisfied or dissatisfied. Happiness with appearance was measured by asking “How happy do you feel about the way you look?”.²⁹

Social Media: There were three questions included in the questionnaire to assess social media usage 1) Do you use social media?; 2) How often do you use social media?; 3) How many hours do you use social media on a typical day?. Pupils were advised that by social media we meant Facebook, Twitter, Instagram, Snapchat etc.

Emotional investment in social media was assessed using the Social Media Use Integration Scale.³⁰ Similar to the methodology used by Woods & Scott, 2016³¹ the term “social media” replaced “Facebook” in six of the questions. A higher overall score indicated a greater level of emotional investment in social media. Questions 1-6 assessed social integration and emotional connection to social media while questions 7-10 assessed integration into social routines.³⁰

Sleep Quality: The Pittsburgh Sleep Index³² is composed of 19 questions which assesses seven components (subjective sleep quality; sleep latency; sleep duration; sleep efficiency; sleep disturbance; use of sleep medication; daytime dysfunction) and was used to measure sleep quality. Each question was scored 0 (no difficulty) to 3 (severe difficulty) and a global score was then calculated (0-21). A higher score indicated poorer sleep quality, and pupils with a score of greater than 5 were classified as “poor sleepers”.³²

Self-efficacy: Self-efficacy for PA was measured using the Children’s PA Self-Efficacy Survey.³³ A higher score indicated greater self-efficacy. To assess self-efficacy for walking, the Children’s PA Self-Efficacy Survey³³ was adapted and the term “walk” replaced “exercise”.³⁴ A higher score indicated greater self-efficacy for walking.

Reasons for engaging in PA: The Behavioral Regulation in Exercise Questionnaire-3 (BREQ3)^{35,36} was administered to assess exercise motivation. The BREQ-3 questionnaire consists of 23-items and includes subscales that assess amotivation, intrinsic, integrated, identified, interjected, and external regulation. Participant responses were scored using an item aggregation approach³⁶ whereby six unique scores were derived by averaging the items of each individual subscale.

Data Analysis:

We explored the missing data patterns by comparing descriptive statistics of pupils with missing data versus those without missing data and by visualising the pattern of missing data via heat maps, lollipop plots, and upset plots (our missing data analysis can be found here: <https://osf.io/6xjku/>). We did not impute missing data because the level of missing data exceeded 15% for most variables. Categorical data were presented as frequencies and percentages and before and during lockdown comparisons for dichotomous variables were made via exact McNemar's tests. Resulting p-values of below 0.05 were interpreted as 'surprising if we assume the null hypothesis is true' and those above 0.05 were interpreted as 'unsurprising if we assume the null hypothesis is true'.

For continuous variables, because of the exploratory nature of the study and the level of missing data, we summarised the data via a five-number summary consisting of the minimum value, maximum value, median, and upper and lower quartiles and visualisation via box plots with paired lines, violin plots, and scatterplots. To compare continuous normally-distributed variables before and during lockdown comparisons we computed mean differences and 95% confidence intervals, whereas for non-normally distributed we calculated nonparametric continuity-corrected 95% confidence

intervals and the median of the difference between a sample from before and a sample from during lockdown.³⁷

All statistical analyses were performed with RStudio version 1.2.5033 (release name: "Orange Blossom"). Our data, code, and full analysis can be found at: <https://osf.io/6xjku/>.

Qualitative Data Collection:

Parent/guardian contact details were obtained at the end of the questionnaire and were used to explain the procedure for pupils who indicated they were willing to take part in the semi-structured interview. Following parental verbal informed consent, a suitable date and time was arranged for the interview. At the start of each interview, the researcher confirmed consent and advised the participant that they could stop the interview at any time without giving reason.

Data Analysis:

Data were collected from individual open-ended semi-structured interviews lasting approximately 15 minutes which were conducted via Zoom© (version 5.2.1) or telephone. The interview guide (Table 1) was used to initiate conversation and ensure consistency between interviews, but the researcher could probe using additional follow-up questions. All interviews were recorded using a digital recorder (Sony ICD-PX370) and transcribed verbatim. Following familiarisation with the data (listening to the audio-recordings and re-reading transcripts), all transcripts were uploaded to NVivo 12 (QSR International Pty Ltd., Doncaster, VIC, Australia), and analysed thematically, following a six phase deductive approach³⁸ (1. Data familiarisation; 2. Generating initial codes; 3. Searching for themes; 4. Reviewing themes; 5. Defining and naming themes; 6. Producing the report). Initially, each meaningful quote or key

example was assigned a code. Codes were then grouped together to develop themes that were representative of the coded excerpts. Once coding had been completed for all transcriptions, definitions and names were then assigned to each theme. For example, codes including lack of motivation, maintenance of skills or fitness, PA for mental health, PA as a coping strategy, PA as a priority or not during lockdown, were grouped together to develop the “changing priorities” theme. Quotes from pupils were used to highlight key themes identified during the interviews.

Results

Participants were recruited from five NI schools, three of which were grammar, one secondary and one grant maintained integrated (mean 25.5% entitled to free school meals). Of the four participating ROI schools, two were community, one secondary and one comprehensive (three were participating in the Delivering Equality of Opportunity in Schools (DEIS) programme). At baseline (pre-lockdown), n=281 adolescent girls completed the questionnaire and at follow up (during lockdown), n=94 girls completed the questionnaire in full. When comparing pupils who had missing data at follow up with those who did not, there was no difference in terms of age, body mass index (BMI), waist:hip ratio (WHR), or any psychological or social media variable assessed. Sample characteristics of pupils at baseline are provided in Table 2.

Physical Activity: Most of the pupils not meeting PA guidelines at baseline were also not meeting guidelines during lockdown (n=46; 58%), while 16 (20%) were meeting the guidelines at both timepoints. However, 12 (15%) pupils not meeting guidelines at baseline were meeting them during lockdown, whereas 6 (8%) pupils meeting

guidelines at baseline did not during lockdown. These changes from pre to during lockdown were unsurprising if we assume there is no difference between the two timepoints (Exact McNemar test, $p = .24$). In addition, the average number of days active (≥ 60 mins MVPA) pre-lockdown compared to during lockdown were almost identical [median (IQR): 4.0 (2) vs. 3.5 (3.5) days].

Sleep Quality: Overall, sleep quality was similar before and during lockdown (Table 3). Before lockdown, 38% of pupils were classed as “poor sleepers” (score greater than 5)³² compared to 41% during lockdown.

Wellbeing: For all the wellbeing outcomes, only 31% of pupils provided lockdown assessment data, therefore, caution is advised when interpreting differences between these timepoints. As outlined in Table 3, there was a small decrease in health-related quality of life scores from before and during lockdown. There was no change in the use of expressive suppression strategies from before and during lockdown; however, there was a slight reduction in the use of cognitive reappraisal strategies (Table 3).

Before lockdown, 20% of pupils reported being unhappy with their appearance, this decreased to 12% during lockdown. Most ($n=71$, 74%) pupils with complete data reported that they were satisfied with their appearance at both timepoints. There was no change in the proportion of pupils dissatisfied with their body weight before (21%) or during lockdown (18%). Most ($n=70$, 73%) pupils were satisfied with their body weight at both timepoints, six (6%) pupils who were satisfied pre-lockdown were dissatisfied during lockdown, whereas, nine (9%) who were dissatisfied pre-lockdown were satisfied during lockdown. Eleven (11%) pupils were dissatisfied with their body weight at both timepoints.

There was a slight increase in self-efficacy for walking during lockdown, but no change in scores for exercise self-efficacy (Table 3). Compared to pre-lockdown, pupils' score for all six subscales (amotivation, external regulation, introjected regulation, identified regulation, integrated regulation and intrinsic regulation) were average one point lower (on 0 to 5 scale) during lockdown.

Social media usage: Only 37% of pupils provided information on social media use during lockdown therefore, caution is advised when interpreting differences between timepoints. Pupils reported spending a similar number of hours on social media during lockdown as before lockdown [median (IQR): 2 (2) vs. 2 (2) h/day]. Social media integration scores were similar pre-lockdown versus during (Table 3). Pre-lockdown integration of social media into social routine scores were slightly lower than during lockdown scores, while there was a small increase in social integration and emotional connection scores from pre-lockdown to during.

Qualitative Interviews

In total, 16 pupils from six schools were interviewed. The mean (SD) age of pupils was 13.8 (0.8) years. The interviews generated discussion on the effects of the COVID-19 restrictions on PA and the main themes are outlined below, (1. The changing landscape of PA during lockdown; 2. Increased discussion about PA; 3. Changing priorities; 4. PA with family). Further illustrative quotes are provided in Table 4.

1. The changing landscape of PA during lockdown

Changes in physical activity levels: Many pupils explained that their level of PA had increased during lockdown: "I think I'm actually doing more cos I'm going on walks during the day cos I'm getting bored, and then I'm going on walks in the evening and

256 then I'm outside playing with my dog" (School_09). However, for some pupils,
 257 particularly those involved in team sports, their PA levels had decreased: "I think it's
 258 went down because I'm not doing as much training as I would have. Like I do try and
 259 go out a walk every day and I do the home workouts, but it would have gone down"
 260 (School_09).

261 *Choice of activity:* A common theme to emerge was the idea of "swapping" activities:
 262 "It has cut Irish dancing out but I am still trying to get on a walk everyday" (School_01).
 263 During lockdown many pupils tried new activities: "I've been out with my football, I've
 264 been practicing that, that's something I wouldn't be doing before" (School_09). Pupils
 265 explained how they were able to access different forms of PA online during lockdown:
 266 "I've never done Zumba before cos there's not one round here but I can do it virtual
 267 now" (School_06). Many indoor recreational facilities were closed during lockdown and
 268 pupils reported how they made use of outdoor facilities: "We would have went to the
 269 beach a lot" (School_01).

270 *Physical distancing:* Social distancing regulations were not a barrier to PA for most
 271 pupils: "I'm not very at risk and no one in my house is at risk so I was a wee bit like it's
 272 ok to go outside but I know for other people that would be more scary" (School_06).
 273 Pupils were able to adapt their activities and plans to adhere to social distancing
 274 regulations: "Me and my friend go out for a walk once a week, social distancing and
 275 stuff" (School_09).

276 2. Increased discussion about PA

277 *PA resources and information:* Pupils noted how there had been increased discussion
 278 about PA during lockdown: "On the news and stuff, it seems to be more of a thing"
 279 (School_09). Pupils discussed that there were many resources available to encourage

280 people to be physically active during lockdown: “There were more people on the TV
281 like providing like workouts and stuff...they were doing stuff on their stories on
282 Instagram and stuff like workouts” (School_09).

283 *Sources of information:* It was also apparent that there had been a change in who
284 provided information on PA: “Before it was on a low scale, it would have been people
285 like the PE teachers and the swimming club coaches, it would have been just them
286 people talking about PA, like none of my friends, but now it’s like all these people are
287 talking about it” (School_09). Pupils discussed several other information sources on
288 PA during lockdown including the news, television and social media: “Well there’s like
289 these things on YouTube and Instagram” (School_01).

290 3. Changing priorities

291 *Benefits of PA:* PA was a priority for many during the lockdown period: “It is more
292 important cos before the lockdown, I wouldn’t really care if I went on walks after school
293 as I had already been doing exercise anyway without knowing it, but now...I know it’s
294 really going to affect me, so I started doing a bit more” (School_08).

295 *Lack of motivation:* However, for some pupils, particularly those involved in team
296 sports, it was difficult to get motivated: “I think it’s [PA] probably less [important]
297 because my life involves around being in camogie and football teams, so I was doing
298 a lot and being part of that but now I’m not doing anything really” (School_09).

299 *PA as a coping strategy:* For other pupils PA helped them cope during the lockdown:
300 “I think it helped me cope, because I could just go outside and be on my own for a
301 while” (School_09). Pupils were aware of the benefits of PA, particularly in terms of
302 mental wellbeing: “I think it [PA] became a lot more important, it’s sort of like with your
303 mental health its very good, like it makes you feel happy and stuff” (School_09).

Maintenance of skills and fitness: For other pupils, PA was a priority during lockdown as they wanted to maintain their fitness levels and skills: “I don’t want to go back and not be able to swim, the things that I was used to be able to swim, so I kind of want to keep my PA up” (School_09).

Time: During the interviews, pupils outlined that while schools were closed, they had time available which enabled them to make PA a priority: “I feel I have more time to go out for walks more often and for longer periods of time” (School_09). PA was also a way of passing time for pupils and was used as a strategy to combat boredom: “I thought it was good cos then it keeps you entertained instead of doing nothing, I like going on a cycle or something” (School_09).

4. PA with family

Social interaction: It was evident that undertaking PA without their friends was challenging and pupils missed the social interaction with their friends and teammates: “Being with your friends makes it really fun, but when you’re not with your friends you don’t chat or anything” (School_09). Pupils found it difficult to exercise on their own and to motivate themselves: “It’s a bit more challenging without them [friends] because they would sometimes push you on and be like you can do it” (School_01).

PA with family: For many young people, PA with friends was replaced with PA with members of their family: “I do beach walks with my family” (School_03). In many cases, this was relatively new and something that they had only started since lockdown: “I would have went out walks or went running with my dad...that would have been quite new doing it together” (School_07).

Discussion

The purpose of this study was to examine changes in PA, mental health, sleep and social media usage in adolescent girls during the COVID-19 lockdown. During lockdown, pupils had increased free time, tried new forms of PA and many undertook PA with their families but there was no significant change in PA levels. There were no changes in sleep quality and social media usage was unchanged. There was a decline in health-related quality of life and motivation for exercise decreased during lockdown, however, self-efficacy for walking and happiness with appearance increased in this cohort.

During lockdown, PA has been one of a few reasons people were permitted to leave their homes³⁹ and there was much positive messaging about PA from sporting organisations and government particularly across social media.⁴⁰ Messaging is just one approach that can be used to reach large numbers of people at a relatively low cost⁴¹ and using mass media, websites and smartphones apps to deliver PA messages to young people may be most effective^{42,43}. The positive messaging during lockdown, may have increased awareness of the importance of PA and prevented a decline in levels of PA among adolescent girls.

In addition, changed circumstances may interrupt 'automatic' behaviour patterns through 'habit discontinuity' leading to formation of new health habits.⁴⁴ During lockdown adolescents reported having more time available for PA as commuting to and from school had ceased and it was estimated that pupils were spending approximately 2.5 hours a day doing schoolwork.⁴⁵ In the absence of a structured school day and homework during lockdown, adolescents may have had additional opportunities to be physically active⁴⁶ as previous evidence has reported homework to be a barrier to PA in this population⁴⁷. Many adolescents had taken up new activities during lockdown including online workouts, virtual dance classes and cycling and for

many families, exercising together was new. This trend has been observed in other studies^{14,48} and it has been reported that 71% of children were taking part in PA with their parent/carer compared to 17% that were exercising online with their friends⁴⁸. Whether these changes are likely to be sustained post-lockdown is currently unknown; however, it is recognised that family-based interventions to increase PA in children are effective⁴⁹ and efforts should be made to sustain this increase in family-based PA to support a long-term improvement in adolescent PA.

Although children and adolescents appear to be less vulnerable than adults to COVID-19⁵⁰, some reports suggest that adolescents may have experienced higher rates of mental ill-health during lockdown^{51,52}. During adolescence, social relationships form and develop where adolescents have increased motivation, enthusiasm and are attuned to peer group, and relationships.⁵³ Social distancing and lockdown measures can result in social isolation⁵⁴ and adolescents may feel frustrated, nervous, disconnected, and bored.¹³ Therefore, there is a need to continually monitor the mental health of adolescents in the longer term to determine how extended school closures, lockdown and social distancing measures affect adolescents.⁵⁵ The data presented in the current manuscript shows that while there was no change in sleep quality and time spent on social media, there was a decrease in health-related quality of life scores. Health-related quality of life may have been negatively influenced by the rapid implementation of social distancing measures and school closures and associated increases in feelings of loneliness, isolation, uncertainty and anxiety⁵¹. As government restrictions are eased, adolescents should be supported to reconnect with friends and access appropriate support.

This study provides insight into the changes in PA, sleep, mental health and social media use of adolescent girls during lockdown. Participating schools varied by type

and socio-economic status and were largely reflective of the demographic characteristics of schools on the island of Ireland. A robust methodology using validated instruments and supplemented by semi-structured interviews generated rich data on the changes in PA during lockdown. Accelerometer data is recognised as an objective method of collecting PA data⁵² and while it was possible to collect accelerometer data for pupils at baseline, this was not possible during lockdown due to school closures and travel restrictions. Therefore, we were reliant on self-reported PA data which the authors acknowledge is dependent on pupils' recall ability⁵⁶ and subject to social desirability bias.⁵⁷ It is also important to acknowledge that while the follow up questionnaire was only completed by 33% of pupils, remote data collection is challenging and was largely dependent on pupil engagement with home learning. As such, the rate of missing data was lower when data collection took place on school premises.

In conclusion, the present study adds to the knowledge base on the impact of restrictive measures implemented to reduce the transmission of COVID-19 on PA, sleep and psychological wellbeing of adolescent girls. While the restrictive measures and school closures were necessary to prevent the spread of disease^{4,5}, we observed a decline in health-related quality of life and motivation for exercise during lockdown. Previous studies have reported declines in the mental health of adolescents during the pandemic^{58,59} and careful monitoring is required in the event of future lockdowns. Schools provide key opportunities for PA⁶⁰, however while they were closed, young people participated in alternative activities. Adolescents should be encouraged to continue with the activities they have enjoyed during lockdown and the principles of habit formation applied to sustain changes in behaviour. As restrictions are eased and schools reopen, there will be many challenges for schools, however; PA should be a

continued priority to optimise the health and wellbeing of adolescents. In the event of future lockdowns, a collective effort involving parents and policy makers is required to promote PA, health and wellbeing⁶¹ particularly among adolescent girls. Furthermore, positive PA messaging should continue, and family-based PA encouraged to prevent any decline in PA.

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The WISH trial is registered with ISRCTN, protocol number ISRCTN 12847782.

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1.	Before coronavirus, school closures and lockdown did you take part in much PA?
2.	Do you think coronavirus restrictions have affected your PA levels?
3.	Did you try any new activities during the coronavirus lockdown?
4.	How have you found it being unable to take part in PA with your friends?
5.	Did you take part in PA with your family during the lockdown or did you exercise on your own?
6.	Did you notice there was more information and discussion about PA during the lockdown?
7.	Did you find that PA helped you cope during the lockdown or did you find that it was hard to get motivated for exercise while the lockdown was ongoing?
8.	Would you say PA was more or less important / a priority to you during the lockdown than normal?
9.	Did the rules around social distancing put you off going outside your house to exercise?
10.	Is there anything about PA and coronavirus that we haven't chatted about that you would like to mention?

Table 1: Interview schedule

	Mean (SD)
Age (years)	12.8 (0.8)
Height (m)	1.6 (0.1)
Body mass (kg)	54.3 (11.5)
BMI (kg/m ²)	21.4 (4.3)
BMI Category, N (%) ^{55,56}	
Underweight	7 (9%)
Healthy weight	210 (75%)
Overweight	33 (12%)
Obese	12 (4%)
Waist:Hip ratio	0.8 (0.1)

Table 2: Sample characteristics of pupils ($n=281$) at baseline

SD = Standard Deviation; BMI = Body Mass Index

	Pre-lockdown			During lockdown			Pre-during lockdown
	N (%)	Median (IQR)	Min-max	N (%)	Median (IQR)	Min-max	MDiff (95% CI)*
Health related quality of life	281 (100)	39 (6)	24-50	104 (37)	36 (6)	23-49	-3.4 (-4.5, -2.5)
Expressive suppression	281 (100)	16 (6)	4-27	96 (34)	15 (6)	5-26	-5.6 (-1.5, 1.0)
Cognitive reappraisal	281 (100)	29 (6)	9-42	96 (34)	26 (7)	10-40	-3 (-4.5, -1.5)
Sleep quality	266 (95)	4 (3.8)	0-16	87 (31)	5 (4.0)	0-17	0.5 (-0.0, 1.0)
Exercise self-efficacy	281 (100)	23 (6)	12-32	94 (33)	24 (6)	10-32	1.0 (0.0, 2.0)
Walking self-efficacy	281 (100)	25 (7)	13-32	94 (33)	27 (6)	12-32	2.0 (1.0, 2.5)
Amotivation	281 (100)	0.8 (2.0)	1-4	94 (33)	0.5 (1.2)	0-4	-1.0 (-1.1, -0.6)
External regulation	281 (100)	2 (2.3)	1-5	94 (33)	1 (1.9)	0-4	-0.9 (-1.1, -0.6)
Introjected regulation	281 (100)	3.3 (1.5)	1-5	94 (33)	2.0 (1.6)	0-4	-1.4 (-1.6, -1.1)
Identified regulation	281 (100)	3.8 (1.0)	1-5	94 (33)	2.5 (1.0)	0-4	-1.3 (-1.5, -1.1)
Integrated regulation	281 (100)	3.5 (1.8)	1-5	94 (33)	1.6 (1.8)	0-4	-1.5 (-1.7, -1.3)
Intrinsic regulation	281 (100)	4.0 (1.0)	1-5	94 (33)	2.8 (1.4)	0-4	-1.2 (-1.4, -1.0)
Social media use integration	269 (96)	37 (15)	11-60	90 (32)	36 (11)	13-53	-0.5 (-2.5, 1.5)
Integration into social routines	269 (96)	18.0 (6.0)	6-36	90 (32)	15.5 (4.0)	6-34	-2.5 (-3.5, -2.0)
Social integration & emotional connection	269 (96)	19.0 (9.0)	5-24	90 (32)	21.0 (8.0)	6-20	2.0 (0.5, 3.5)

Table 3: Changes in psychological variables and social media usage from before to during lockdown

Key: MDiff = median of the difference between a sample from before and a sample from after.

* continuity-corrected nonparametric 95% confidence intervals

Theme	Quote
1. The changing landscape of PA during lockdown	<p>"It [lockdown] has cut Irish dancing out but I am still trying to get on a walk every day."</p> <p>"All those things I did are now cancelled so all the activities I have to do now would be on my own."</p> <p>"I'm not walking to school and back so that affects that physical activity and we are at home, so we don't really get that much just walking upstairs and downstairs."</p> <p>"If you're meeting up with somebody...the footpaths aren't wide enough but it wouldn't put me off [walking] that much."</p>
2. Increased discussion about PA	<p>"There is stuff on the news, you can do this like Joe Wicks and all that and you sort of talk about it as well."</p> <p>"On like social media there would be a lot of ads, the perfect time to get your summer body or keep active at home, a lot more workouts that I didn't know personally about becoming more popular and I would hear about them lot over social media."</p> <p>"There was a lot of like social media influencers that I would have followed, and this would have been the time to get active and all these different apps and trainers."</p> <p>"You sort of see a whole bunch of people on social media saying this is a good time to do it [physical activity] so you're like yeah so if they're doing it, I'm doing it."</p>
3. Changing priorities	<p>"Well I thought it [physical activity] was good cos then it keeps you entertained instead of doing nothing, I like going on a cycle or something."</p> <p>"It makes you feel better when you have done exercise otherwise if you don't do it you feel lazy because you're just sitting in the house all day. If everyone is annoying you in the house, you can just go and be away from them."</p> <p>"[Physical activity] was probably less important because it wasn't like a team, it wasn't like trying to win a competition or anything, you know it wasn't as fun."</p> <p>"It is more important because before the lockdown, I wouldn't really care if I went on walks after school as I had already been doing exercise anyway without knowing it, but now with technology I notice I barely do anything."</p>
4. PA with family	<p>"Most of it [physical activity] was with my family, I would have went out walks or went running with my dad."</p> <p>"Because I was at clubs, I wouldn't have walked with her [mum], but now because I'm not at the clubs I walk with her"</p>

“I would walk the dog with my parents...I would have rarely like gone for a walk because I would have been too busy with school-work and training but yeah it probably would have been something new that I’m just doing now.”

“At the start of lockdown I was doing the workout app, but then at the minute I’m just going out for walks and cycles with my family and stuff...we’ve went on a couple of walks every few evenings every week for the past couple of years now, so we’ve been doing that like normally anyway but, like walking a bit more since lockdown started.”

Table 4: Emerging themes and key quotes from the semi-structured interviews